GRADE 8

Pearson Appeal of Prentice Hall Courses 1, 2 and 3

Course 3 Appeal Table of Contents

Indiana Appeal for Prentice Hall Mathematics Course 3

Standards that Received a "2" Rating

Pearson Correlation Documentation

Standard	Definition	Lesson Covered	Notes
8.G.5	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.	Lessons 4-4, 7-2, CC-5, Activity Lab 7-5a	Final format of lesson CC-5 included in appeal binder
8.SP.2	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.	Lessons 9-7, CC-8	Final format of lesson CC-8 included in appeal binder

Standards that Received a "1" Rating

Pearson Correlation Documentation

Standard	Definition	Lesson Covered	Notes
8.NS.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π2).	Lesson 3-1	
8.EE.2	Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.	Lessons 3-1, CC-1	Final format of lesson CC-1 included in appeal binder

8.EE.4	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.	Lessons 2-8, 12-3, 12-5 Activity Labs 2-8b, 12-3b	
8.EE.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.	Lessons 11-4, CC-11, Activity Lab 11-4a	Final format of lesson CC-11 included in appeal binder
8.EE.6	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.	11-4, 11-5, 11-6,CC-10, Activity Labs 11-4a, 11-5a	Final format of lesson CC-10 included in appeal binder
8.EE.7.a	Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).	Lessons 6-1, 6-3, 6-4, CC-3	Final format of lesson CC-3 included in appeal binder
8.EE.8.a	Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.	Lessons CC-5, CC-11, GPS p. 544	Final format of lessons CC-5 and CC-11 included in appeal binder
8.EE.8.b	Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection.	Lesson CC-11	Final format of lesson CC-11 included in appeal binder
8.EE.8.c	Solve real-world and mathematical problems leading to two linear equations in two variables.	Lesson CC-11	Final format of lesson CC-11 included in appeal binder

8.F.1	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. NOTE Function notation is not required in Grade 8.	Lessons 11-3, 11-5	
8.F.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	Lessons 11-6, CC-13	Final format of lesson CC-13 included in appeal binder
8.G.1.a	Lines are taken to lines, and line segments to line segments of the same length.	Lessons 3-6, 3-7, 2-8, CC-5	Final format of lesson CC-5 included in appeal binder
8.G.1.b	Angles are taken to angles of the same measure.	Lessons 3-6, 3-7, 3-8, CC-5	Final format of lesson CC-5 included in appeal binder
8.G.1.c	Parallel lines are taken to parallel lines.	Lessons 3-6, 3-7, 3-8, CC-5	Final format of lesson CC-5 included in appeal binder
8.SP.1	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	Lesons 9-7, CC-7 Activity Lab 9-7a	Final format of lesson CC-7 included in appeal binder
8.SP.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.	Lesson CC-8	Final format of lesson CC-8 included in appeal binder
8.SP.4	Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.	Lesson CC-9	Final format of lesson CC-9 included in appeal binder

Correlation of Standards for Mathematical Content
Prentice Hall Course 3

The following shows the alignment of *Prentice Hall Course 3* to the Grade 8 Common Core State Standards for Mathematics.

Standards for Mathematical Content		Where to find in *PH Course 3*
The Number System		
Know that there are numbers that are not rational, and approximate them by rational numbers.		
8.NS.1	Understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions that terminate in 0s or eventually repeat. Know that other numbers are called irrational.	2-2, 3-1
8.NS.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of* $\sqrt{2}$, *show that* $\sqrt{2}$ *is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*	3-1

Standards for Mathematical Content		Where to find in *PH Course 3*
Expressions and Equations		
Use properties of operations to generate equivalent expressions.		
8.EE.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.	2-7, 12-3, 12-5
8.EE.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.	3-1, CC-1
8.EE.3	Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.*	2-8, 12-5
8.EE.4	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.	2-8, 12-3, 12-5 Activity Labs 2-8b, 12-3b
Understand the connections between proportional relationships, lines, and linear equations.		
8.EE.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*	11-4, CC-11, Activity Lab 11-4a
8.EE.6	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.	11-4, 11-5, 11-6, CC-10, Activity Labs 11-4a, 11-5a
Analyze and solve linear equations and airs of simultaneous linear		

equations.		
8.EE.7	Solve linear equations in one variable.	6-1, 6-3, 6-4
8.EE.7 .a	Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).	6-1, 6-3, 6-4, CC-3
8.EE.7 .b	Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.	6-1, 6-3, 6-4
8.EE.8	Analyze and solve pairs of simultaneous linear equations.	GPS, p. 544
8.EE.8 .a	Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.	CC-5, CC-11, GPS, p. 544
8.EE.8 .b	Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.*	CC-11
8.EE.8 .c	Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*	CC-11

Standards for Mathematical Content		Where to find in *PH Course 3*
Functions		
Define, evaluate, and compare functions.		
8.F.1	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. NOTE Function notation is not required in Grade 8.	11-3, 11-5
8.F.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*	11-6, CC-13
8.F.3	Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.*	11-5, 11-7
Use functions to model relationships between quantities.		
8.F.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.	11-3, 11-4, 11-5, 11-6, Activity Labs 3-5b, 11-4a
8.F.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	11-2, 11-6

Standards for Mathematical Content		Where to find in *PH Course 3*
Geometry		
Understand congruence and similarity using physical models, transparencies, or geometry software.		
8.G.1	Verify experimentally the properties of rotations, reflections, and translations:	3-6, 3-7, 3-8, Activity Labs 3-7a, 3-8a
8.G.1.a	Lines are taken to lines, and line segments to line segments of the same length.	3-6, 3-7, 2-8, CC-5
8.G.1.b	Angles are taken to angles of the same measure.	3-6, 3-7, 3-8, CC-5
8.G.1.c	Parallel lines are taken to parallel lines.	3-6, 3-7, 3-8, CC-5
8.G.2	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.	7-3, CC-5
8.G.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	3-6, 3-7, 3-8, 4-5
8.G.4	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two dimensional figures, describe a sequence that exhibits the similarity between them.	4-4, 4-5, CC-5
8.G.5	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*	4-4, 7-2, CC-5, Activity Lab 7-5a
Understand and apply the Pythagorean Theorem.		
8.G.6	Explain a proof of the Pythagorean Theorem and its converse.	3-2, CC-2, Activity Lab 3-2a, Extension 3-3

8.G.7	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	3-3, CC-6
8.G.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	3-4
8.G.9	Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.	8-6, 8-7, 8-8

	Standards for Mathematical Content	Where to find in *PH Course 3*
	Statistics and Probability	
Investigate patterns of association in bivariate data.		
8.SP.1	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.	9-7, CC-7, Activity Lab 9-7a
8.SP.2	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.	9-7, CC-8
8.SP.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height*	CC-8
8.SP.4	Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*	CC-9

Pacing for a Common Core Curriculum
with *Prentice Hall Course 3*

This pacing chart can help you plan your course as you transition to a curriculum based on the Common Core State Standards (CCSS). The Chart indicates the Standard(s) for Mathematical Content that each lesson addresses and proposes pacing for each chapter. Included in the chart are CC Lessons that offer in-depth coverage of certain standards. These lessons along with the lessons in the Student Edition provide comprehensive coverage of all of the Common Core State Standards for Grade 8.

The suggested number of days for each chapter is based on a traditional 45-minute class period and on a 90-minute block period. The total of 142 days of instruction leaves time for review and enrichment lessons, additional activity labs, assessments, and projects.

* Content to meet the Grade 8 Common Core State Standards
+ Reviews content from previous years
∞ Content for enrichment

	Standards of Mathematical Content	On-Level	Advanced
Chapter 1 Integers and Algebraic Expressions Traditional 8 days Block 4 days			
1-1 Algebraic Expressions and the Order of Operations	Reviews 6.EE.2.c	+	
1-2 Integers and Absolute Value	Reviews 6.NS.7.c	+	+
1-3 Adding and Subtracting Integers	Reviews 7.NS.1.d	+	+
1-4 Multiplying and Dividing Integers	Reviews 7.NS.2.a	+	+
1-5 Properties of Numbers	Reviews 6.EE.3	+	+
1-6 Solving Equations by Adding and Subtracting	Reviews 6.EE.7	+	
1-7 Solving Equations by Multiplying and Dividing	Reviews 6.EE.7	+	

	Standards of Mathematical Content	On-Level	Advanced
Chapter 2 Rational Numbers Traditional 8 days Block 4 days			
2-1 Factors	Reviews 6.NS.4	+	
2-2 Equivalent Forms of Rational Numbers	8.NS.1	*	*
2-3 Comparing and Ordering Rational Numbers	Reviews 6.NS.7.b	+	
2-4 Adding and Subtracting Rational Numbers	Reviews 7.NS.1.d	+	
2-5 Multiplying and Dividing Rational Numbers	Reviews 7.NS.2.c	+	
2-6 Formulas	Reviews 6.EE.2.c	+	+
2-7 Powers and Exponents	8.EE.1	*	*
2-8 Scientific Notation	8.EE.3, 8.EE.4	*	*
Chapter 3 Real Numbers and the Coordinate Plane Traditional 24 days Block 12 days			
3-1 Exploring Square Roots and Irrational Numbers	8.NS.1, 8.NS.2, 8.EE.2	*	*
CC-1 Cube Roots	8.EE.2	*	*
3-2a Activity Lab: Exploring the Pythagorean Theorem	8.G.6	*	*
3-2 The Pythagorean Theorem	8.G.6	*	*
3-3 Using the Pythagorean Theorem	8.G.6	*	*
CC-2 Converse of the Pythagorean Theorem	8.G.6	*	*
3-3 Extension: Analyzing Triangles	8.G.7	*	*
3-4 Graphing in the Coordinate Plane	8.G.8	*	*
3-5 Equations, Tables, and Graphs	Reviews 6.EE.9	+	+
3-5b Activity Lab: Matching Graphs	8.F.4	*	*
3-6 Translations	8.G.1, 8.G.1.a, 8.G.1.b, 8.G.1.c, 8.G.3	*	*
3-7a Activity Lab: Exploring Reflections	8.G.1	*	*

	Standards of Mathematical Content	On-Level	Advanced
3-7 Reflections and Symmetry	8.G.1, 8.G.1.a, 8.G.1.b, 8.G.1.c, 8.G.3	*	*
3-8a Activity Lab: Exploring Rotations	8.G.1	*	*
3-8 Rotations	8.G.1, 8.G.1.a, 8.G.1.b, 8.G.1.c, 8.G.3	*	*

	Standards of Mathematical Content	On-Level	Advanced
Chapter 4 Applications of Proportions	**Traditional 8 days**	**Block 4 days**	
4-1 Ratios and Rates	Reviews 7.RP.1	+	+
4-2 Converting Units		+	
4-3 Solving Proportions	Reviews 7.RP.3	+	+
4-4 Similar Figures and Proportions	8.G.4, 8.G.5	*	*
4-5 Similarity Transformations	8.G.3, 8.G.4	*	*
4-6 Scale Models and Maps	Reviews 7.G.1	+	
4-7 Similarity and Indirect Measurement	Reviews 7.G.1	+	
Chapter 5 Application of Percent	**Traditional 8 days**	**Block 4 days**	
5-1 Fractions, Decimals, and Percents	Reviews 7.EE.3	+	+
5-2 Estimating With Percents		+	
5-3 Percents and Proportions	Reviews 7.RP.3	+	+
5-4 Percents and Equations	Reviews 6.RP.3.c	+	+
5-5 Percent of Change	Reviews 7.RP.3	+	
5-6 Markup and Discount	Reviews 7.RP.3	+	
5-7 Simple Interest	Reviews 7.RP.3	+	
5-8 Ratios and Probability	Reviews 7.SP.8.b	+	+

	Standards of Mathematical Content	On-Level	Advanced
Chapter 6 Equations and Inequalities	**Traditional 12 days Block 6 days**		
6-1a Activity Lab: Modeling Multi-Step Equations	8.EE.7, 8.EE.7.a, 8.EE.7.b	*	*
6-1 Solving Two-Step Equations	8.EE.7, 8.EE.7.a, 8.EE.7.b	*	*
6-2 Simplifying Algebraic Expressions	Reviews 7.EE.1	+	+
6-3 Solving Multi-Step Equations	8.EE.7, 8.EE.7.a, 8.EE.7.b	*	*
6-4 Solving Equations With Variables on Both Sides	8.EE.7, 8.EE.7.a, 8.EE.7.b	*	*
CC-3 Types of Solutions of Linear Equations	8.EE.7.a	*	*
6-5 Solving Inequalities by Adding or Subtracting	Reviews 7.EE.4.b	+	
6-6 Solving Inequalities by Multiplying or Dividing	Reviews 7.EE.4.b	+	
Chapter 7 Geometry	**Traditional 10 days Block 5 days**		
7-1a Activity Lab: Exploring Pairs of Angles	Reviews 7.G.5	+	
7-1 Pairs of Angles	Reviews 7.G.5	+	+
7-2 Angles and Parallel Lines	8.G.5	*	*
7-3 Congruent Polygons	8.G.2	*	*
CC-4 Transformations and Congruency	8.G.1.a, 8.G.1.b, 8.G.1.c, 8.G.2	*	*
CC-5 Transformations and Similarity	8.G.4, 8.G.5	*	*
7-4 Classifying Triangles and Quadrilaterals	Reviews 5.G.3	+	
7-5a Activity Lab: Angle Sums	8.G.5	*	*
7-5 Angles and Polygons	Reviews 7.G.5	+	
7-6 Areas of Polygons	Reviews 6.G.1	+	
7-7 Circumference and Area of a Circle	Reviews 7.G.4	+	
7-8 Constructions			∞

	Standards of Mathematical Content	On-Level	Advanced
Chapter 8 Measurement	**Traditional 10 days Block 5 days**		
8-1 Solids		+	
8-2 Drawing Views of Three-Dimensional Figures	Reviews 5.MD.5	+	+
8-3 Nets and Three-Dimensional Figures	Reviews 6.G.4	+	
8-4 Surface Areas of Prisms and Cylinders	Reviews 6.G.4	+	
8-5 Surface Areas of Pyramids and Cones	Reviews 6.G.4	+	
CC-6 Using the Pythagorean Theorem With Three-Dimensional Figures	8.G.7, 8.G.7	*	*
8-6 Volume of Prisms and Cylinders	8.G.9	*	*
8-7 Volumes of Pyramids and Cones	8.G.9	*	*
8-8 Spheres	8.G.9	*	*
8-9 Exploring Similar Solids		∞	∞

	Standards of Mathematical Content	On-Level	Advanced
Chapter 9 Using Graphs to Analyze Data	**Traditional 14 days Block 7 days**		
9-1 Finding Mean, Median, and Mode	Reviews 6.SP.5.c	+	
9-2 Displaying Frequencies	Reviews 6.SP.4	+	
9-3 Venn Diagrams		∞	∞
9-4 Reading Graphs Critically		∞	∞
9-5 Stem-and-Leaf Plots		∞	∞
9-6 Box-and-Whisker Plots	Reviews 6.SP.4	+	
9-7a Activity Lab: Scatter Plots	8.SP.1	*	*
9-7 Making Predictions From Scatter Plots	8.SP.1, 8.SP.2	*	*
CC-7 Exploring Bivariate Data	8.SP.1	*	*
CC-8 Lines of Best Fit	8.SP.2, 8.SP.3	*	*
9-8 Circle Graphs		∞	∞
9-9 Choosing an Appropriate Graph		∞	∞
CC-9 Relative Frequency	8.SP.4	*	*
Chapter 10 Probability	**Traditional 8 days Block 4 days**		
10-1 Theoretical and Experimental Probability	Reviews 7.SP.7, 7.SP.6	+	+
10-2 Making Predictions	Reviews 7.SP.2	+	+
10-3 Conducting a Survey	Reviews 7.SP.1	+	
10-4 Independent and Dependent Events	Reviews 7.SP.8.c	+	
10-5 Permutations			∞
10-6 Combinations			∞

	Standards of Mathematical Content	On-Level	Advanced
Chapter 11 Functions **Block 12 days**		**Traditional 24 days**	
11-1 Sequences	Reviews 5.OA.3	+	+
11-2 Relating Graphs to Events	8.F.5	*	*
11-3 Functions	8.F.1, 8.F.4	*	*
11-4a Activity Lab: Rate of Change	8.EE.5, 8.EE.6, 8.F.4	*	*
11-4 Understanding Slope	8.EE.5, 8.EE.6, 8.F.4	*	*
CC-10 Slope and Similar Triangles	8.EE.6	*	*
11-5a Activity Lab: Graphing Equations	8.EE.6	*	*
11-5 Graphing Linear Functions	8.EE.6, 8.F.1, 8.F.3, 8.F.4	*	*
CC-11 Graphing Proportional Relationships	8.EE.5	*	*
11-6 Writing Rules for Linear Functions	8.EE.6, 8.F.2, 8.F.4, 8.F.5	*	*
CC-12 Solving Systems of Equations	8.EE.8.a, 8.EE.8.b, 8.EE.8.c	*	*
GPS: Linear Functions	8.EE.8, 8.EE.8.a	*	*
11-7 Quadratic and Other Nonlinear Functions	8.F.3	*	*
CC-13Comparing Functions	8.F.2	*	*
Chapter 12 Polynomials and Properties of Exponents **Block 4 days**		**Traditional 8 days**	
12-1 Exploring Polynomials	Prepares for A-APR.1		∞
12-2 Adding and Subtracting Polynomials	Prepares for A-APR.1		∞
12-3 Exponents and Multiplication	8.EE.1, 8.EE.4	*	*
12-3b Activity Lab: Scientific Notation	8.EE.4	*	*
12-4 Multiplying Polynomials	Prepares for A-	∞	∞

	Standards of Mathematical Content	On-Level	Advanced
	APR.1		
12-5 Exponents and Division	8.EE.1, 8.EE.3, 8.EE.4	*	*

Common Core Supplemental Lessons
Prentice Hall Course 3

The supplemental lessons listed below are available for *Prentice Hall Course 3.* These lessons ensure comprehensive coverage of all of the Grade 8 Standards for Mathematical Content that are in Common Core State Standards.

CC-1 Cube Roots

CC-2 Pythagorean Proofs

CC-3 Types of Solutions of Linear Equations

CC-4 Transformations and Congruency

CC-5 Transformations and Similarity

CC-6 Using the Pythagorean Theorem with Three-Dimensional Figures

CC-7 Exploring Bivariate Data

CC-8 Modeling Data with Lines

CC-9 Relative Frequency

CC-10 Slope and Similar Triangles

CC-11 Graphing Proportional Relationships

CC-12 Solving Systems of Equations

CC-13 Comparing Functions

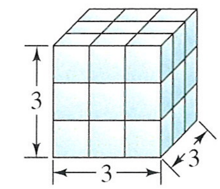
CC-1 Cube Roots

CONTENT STANDARDS

8.EE.2 Use … cube root symbols to represent solutions to equations of the form … $x^3 = p$, where p is a positive rational number. Evaluate … cube roots of small perfect cubes …

A cube number is a power with an exponent of 3. The cube of a whole number is a **perfect cube**. $3 \cdot 3 \cdot 3 = 3^3 = 27$.

You can work backward from a perfect cube, such as 27, to find the number 3. This is called a cube root. The **cube root** of a number is another number that, when raised to the third power, is equal to the given number. The number 3 is the cube root of 27.



The symbol $\sqrt[3]{}$ means the cube root of a number.
$\sqrt[3]{27} = \sqrt[3]{3^3} = 3$.

Test Prep Tip

Volume is measured in cubic units. Area is measured in square units. Length is measured in linear units.

EXAMPLE Finding Cube Roots

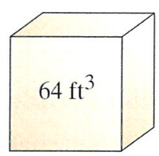
1 A cube-shaped packing box has a volume of 64 cubic feet. What is the side length of the box?

The formula for the volume V of a cube is $V = s^3$, where s is the length of one side.

So, the length of one side s is $\sqrt[3]{V}$, the cube root of the volume V.

$$s = \sqrt[3]{V} = \sqrt[3]{64} = 4$$

The side length of the box is 4 feet.



Think: $64 = 4 \cdot 4 \cdot 4$

Quick Check

1. Find each cube root.

   a. $\sqrt[3]{125}$ b. $\sqrt[3]{1}$ c. $\sqrt[3]{512}$

You can find cube roots by solving equations of the form $x^3 = p$.
To find the cube root of a fraction, find the cube root of the numerator and the cube root of the denominator.

$$\sqrt[3]{\frac{1}{27}} = \frac{\sqrt[3]{1}}{\sqrt[3]{27}} = \frac{1}{3}$$

Use after Lesson 3-1.

EXAMPLE Solving Cube Root Equations

Test Prep Tip

One way to find a cube root is to guess a number and raise it to the third power. The cube of an even number will always be even and the cube of an odd number will always be odd.

2 Solve $x^3 = \frac{1}{8}$.

$x^3 = \frac{1}{8}$ ← Write the equation.

$\sqrt[3]{x^3} = \sqrt[3]{\frac{1}{8}}$ ← Take the cube root of each side.

$= \frac{\sqrt[3]{1}}{\sqrt[3]{8}}$ ← Rewrite the cube root of the fraction.

$x = \frac{1}{2}$ ← Simplify. *Think:* $1 = 1 \cdot 1 \cdot 1$ and $8 = 2 \cdot 2 \cdot 2$.

Quick Check

2. Solve each equation.

a. $x^3 = 216$ **b.** $x^3 = \frac{1}{27}$ **c.** $x^3 = \frac{8}{343}$

Homework Exercises

GO for Help

For Exercises	See Examples
1–9	1
10–15	2

Find the side length of a cube with each given volume.

1. 1,000 m^3 **2.** 1 cm^3 **3.** 729 ft^3

Find each cube root.

4. $\sqrt[3]{216}$ **5.** $\sqrt[3]{8}$ **6.** $\sqrt[3]{64}$

7. $\sqrt[3]{27}$ **8.** $\sqrt[3]{512}$ **9.** $\sqrt[3]{343}$

Solve each equation.

10. $x^3 = 125$ **11.** $x^3 = 729$ **12.** $x^3 = \frac{1}{216}$

13. $x^3 = \frac{27}{125}$ **14.** $x^3 = \frac{512}{729}$ **15.** $x^3 = \frac{343}{1,000}$

GPS

16. Guided Problem Solving Find the cube root of 0.008.

- Can you rename the decimal as a fraction?
- Write your answer as a decimal. Check by cubing your answer.

17. Find the cube root of 0.216.

18. Writing in Math Is 0.3 the cube root of 0.27? Explain.

19 a. Copy and complete the table below.

x	1	2	3	4	5	6	7	8	9	10
x^2										
x^3										

b. Are any of the numbers both a perfect square and a perfect cube?

c. When x is a perfect square, what is true about the cube of x?

CC-2 Pythagorean Proofs

CONTENT STANDARDS

8.G.6 Explain a proof of the Pythagorean Theorem and its converse.

The Pythagorean Theorem states that if a triangle is a right triangle, then $a^2 + b^2 = c^2$, where a and b are the lengths of the legs of the triangle and c is the length of the hypotenuse.

ACTIVITY

MATHEMATICAL PRACTICES

1. Cut straws of lengths of 6, 8, and 10 centimeters. Do the lengths of the straws satisfy the Pythagorean equation? Explain.
2. Arrange the straws to form a triangle. Use a protractor to measure the angles. Is the triangle always a right triangle?
3. Cut straws of the following lengths in centimeters: 3, 4, 5, 9, 12, 13, 15, 16, 20, and 25.
4. Identify each set of three straws that satisfies the Pythagorean equation.
5. Construct a triangle from each set of straws you identified. Use a protractor to measure each of the angles.
6. If the three side lengths of a triangle satisfy the equation $a^2 + b^2 = c^2$, what must be true about the triangle? Explain.

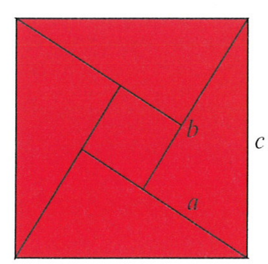
Vocabulary Tip

The converse of the statement "if *x*, then *y*" is the statement "if *y*, then *x*."

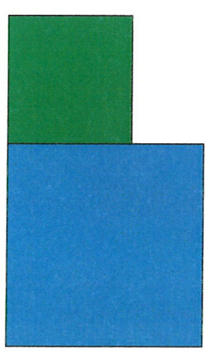
A proof is a series of logical steps that leads from given information to the statement that is being proven.

ACTIVITY

MATHEMATICAL PRACTICES



1. Write an algebraic expression for the area of the large red square.
2. Trace and cut out the pieces of the large red square. Rearrange the pieces to cover exactly the green and blue square at the left. How do the areas compare?
3. What is the side length of the green square? The blue square?
4. Write an algebraic expression for the area of the figure composed of the green and blue squares.
5. Write an equation relating the area of the blue figure to the area of the large red square. What do you notice about the equation?
6. Summarize your findings. How does this relate to the Pythagorean Theorem?

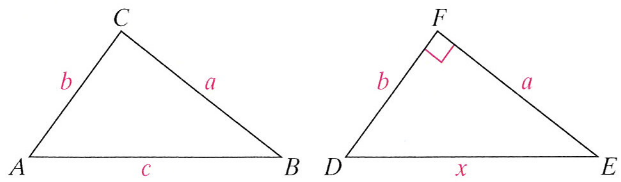


Use after Lesson 3-3.

ACTIVITY

MATHEMATICAL PRACTICES

In $\triangle ABC$, $a^2 + b^2 = c^2$. Triangle DEF is a right triangle as shown.



1. Write an equation relating the side lengths of $\triangle DEF$.
2. Use the equation for $\triangle ABC$ and your equation for $\triangle DEF$ to write an equation relating c and x.
3. If all three sides of a triangle are the same length as all three sides of another triangle, then the angles of the triangles are congruent. Use this fact to identify congruent angles in $\triangle ABC$ and $\triangle DEF$.
4. Classify $\triangle ABC$.
5. Summarize your findings to explain a proof of the Converse of the Pythagorean Theorem.

Vocabulary Tip

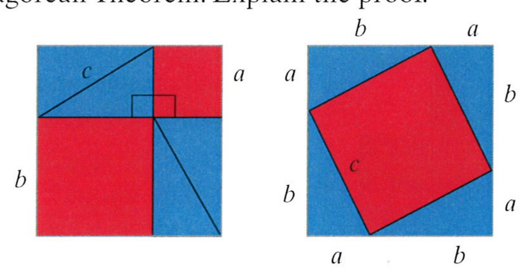
Congruent angles are angles with equal measures.

Exercises

Explain if a triangle with the given side lengths is a right triangle.

1. 18, 24, 30	**2.** 7, 24, 25	**3.** 13, 14, 15
4. 8, 15, 17	**5.** 10, 24, 25	**6.** 15, 36, 39

7. Construct a triangle with side lengths of 3 cm, 4 cm, and 5 cm; another triangle with side lengths of 6 cm, 8 cm, and 10 cm; and a third triangle with side lengths of 5 cm, 12 cm, and 13 cm. Measure the angles of each triangle with a protractor. How are the side lengths and angle measures related?
8. **Writing in Math** The two squares below represent another proof of the Pythagorean Theorem. Explain the proof.



9. Is it possible for a triangle that is *not* a right triangle to have side lengths that satisfy the Pythagorean equation? Why or why not?
10. How is the Pythagorean equation used in the proof of the Converse of the Pythagorean Theorem?

CC-3 Types of Solutions of Linear Equations

CONTENT STANDARDS

8.EE.7.a Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).

You can find the number of solutions by successively transforming a given equation into simpler forms. In the algebraic forms below, x represents the variable, and a and b represent different numbers.

Algebraic Form	Number of Solutions	Description
$a = b$	None	There are *no* values of the variable for which the equation is true.
$x = a$	One	The equation is true for *exactly one* value of the variable.
$a = a$	Infinitely many	The equation is true for *all* values of the variable.

EXAMPLE Identifying Types of Solutions

1 Tell whether each equation has one solution, infinitely many solutions, or no solution. Justify your answer.

a.
$$\begin{aligned} 2x - 4 &= -x - 1 \\ 2x + 1x - 4 &= -x + 1x - 1 && \leftarrow \text{Add } 1x \text{ to each side.} \\ 3x - 4 &= -1 && \leftarrow \text{Simplify.} \\ 3x - 4 + 4 &= -1 + 4 && \leftarrow \text{Add 4 to each side.} \\ 3x &= 3 && \leftarrow \text{Simplify.} \\ x &= 1 && \leftarrow \text{Divide both sides by 3.} \end{aligned}$$

The result is an equation of the form $x = a$. This equation is true for exactly one value. So, the equation has one solution.

b.
$$\begin{aligned} 2x - 4 &= 2(x - 2) \\ 2x - 4 &= 2x - 4 && \leftarrow \text{Use the Distributive Property.} \\ 2x - 4 - 2x &= 2x - 4 - 2x && \leftarrow \text{Subtract } 2x \text{ from each side.} \\ -4 &= -4 && \leftarrow \text{Simplify.} \end{aligned}$$

The result is an equation of the form $a = a$. This equation is true for all values of x. So, the equation has infinitely many solutions.

c.
$$\begin{aligned} 2x - 4 &= 2(x + 1) \\ 2x - 4 &= 2x + 2 && \leftarrow \text{Use the Distributive Property.} \\ 2x - 4 - 2x &= 2x + 2 - 2x && \leftarrow \text{Subtract } 2x \text{ from each side.} \\ -4 &= 2 && \leftarrow \text{Simplify.} \end{aligned}$$

The result is an equation of the form $a = b$. There are no values of x for which the equation is true. So, the equation has no solution.

Test Prep Tip

Check the type of solution by substituting different values for the variable in the original equation.

Use after Lesson 6-4.

Quick Check

1. Tell whether each equation has one solution, infinitely many solutions, or no solution. Justify your answer.
   a. $5x + 8 = 5(x + 3)$ b. $9x = 8 + 5x$
   c. $6x + 12 = 6(x + 2)$ d. $7x - 11 = 11 - 7x$

Homework Exercises

GO for Help

For Exercises	See Example
1–12	1

Tell whether each equation has one solution, infinitely many solutions, or no solution. Justify your answer.

1. $4x + 8 = 4(x + 4)$
2. $5x = 9 + 2x$
3. $x + 9 = 7x + 9 - 6x$
4. $3x + 3 = 3(x + 1)$
5. $22y = 11(3 + y)$
6. $-3t + 1 = t + 9 - 4t$
7. $16z - 24 = 8(2z - 3)$
8. $-5w = 7 - 4w + 8$
9. $4(-x - 1.6) = -4x + 6.4$
10. $1 + c + 1.4 = c + 2.4$
11. $\frac{5}{3}s = \frac{15}{3} + \frac{3}{2}s - \frac{1}{4}$
12. $-\frac{2}{9}\left(-n + \frac{3}{9}\right) = \frac{2}{9}n - \frac{5}{9}$

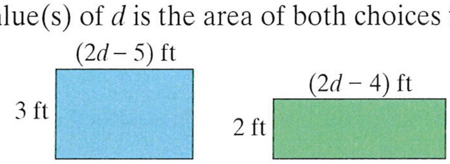
GPS

13. **Guided Problem Solving** Six more than a number equals two times the sum of one-half the number plus three. Is this statement true for only one number, for all numbers, or for no numbers? Explain your reasoning.
    - Write an equation to represent the statement.
    - Simplify the equation until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results.

14. Two more than a number equals three times the sum of one third of the number plus six. Is this statement true for only one number, for all numbers, or for no numbers? Explain your reasoning.

15. **Open Ended** The equation $20y + 4 = 4(3y + 1)$ has exactly one solution. Change one number in the original equation to create a new equation that has infinitely many solutions. Then change one number in the new equation to create another equation that has no solution.

16. **Geometry** Greg is buying fabric from a store. He has the choice of buying fabric that is 2 feet wide or 3 feet wide. The diagrams show how much fabric of each type he can buy for d dollars.
    a. For what value(s) of d is the perimeter of both choices the same?
    b. For what value(s) of d is the area of both choices the same?



17. **Writing in Math** In the process of simplifying an equation, Marco eliminated all the variables. How many solutions could the original equation have? Explain your reasoning.

CC-4 Transformations and Congruency

CONTENT STANDARDS

8.G.1.a Lines are taken to lines, and line segments to line segments of the same length.

8.G.1.b Angles are taken to angles of the same measure.

8.G.1.c Parallel lines are taken to parallel lines.

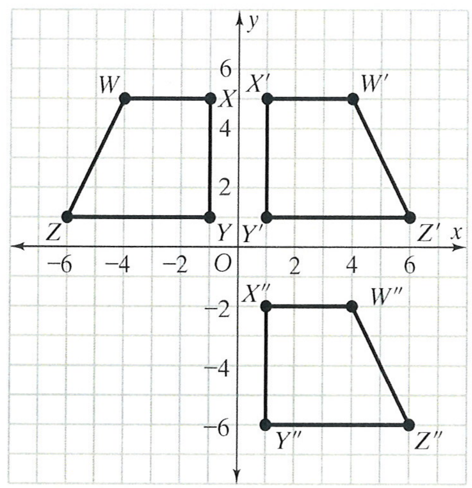
8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

Rotations, reflections, and translations change the position and orientation of a figure, but they do not change its size or shape. When one of these transformations is performed, the figure and its image are congruent.

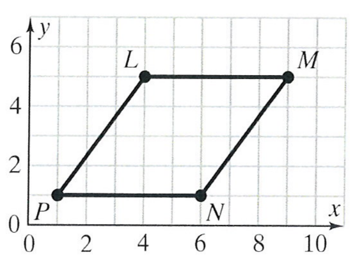
ACTIVITY

MATHEMATICAL PRACTICES

The diagram below shows a sequence of transformations.



1. Describe the sequence of transformations that maps trapezoid $WXYZ$ to trapezoid $W''X''Y''Z''$.
2. Find the length of $\overline{WX}$. Which other line segments are congruent to $\overline{WX}$?
3. Does a sequence of transformations maintain congruence? Use the lengths of the line segments to justify your answer.
4. Use a protractor to measure the angles of each trapezoid. Does a sequence of transformations maintain congruence of angles?
5. $\overline{WX}$ is parallel to $\overline{YZ}$. Are the corresponding sides of the images of the trapezoid still parallel?
6. Is trapezoid $WXYZ$ congruent to trapezoid $W''X''Y''Z''$? Explain how you know.
7. Rotate parallelogram $LMNP$ at the left 90° about the point L to form parallelogram $L'M'N'P'$.
   a. Are the corresponding line segments and angles congruent?
   b. Are the corresponding parallel lines still parallel?

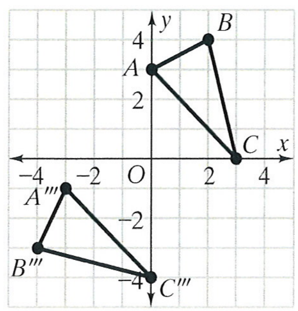


Use after Lesson 7-3.

ACTIVITY

MATHEMATICAL PRACTICES

Identify a sequence of three transformations to obtain $\triangle A'''B'''C'''$ from $\triangle ABC$. Copy $\triangle ABC$ on a coordinate grid, as shown below.



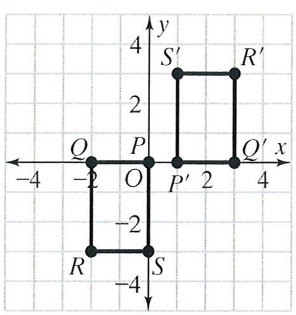
Transformations
Reflection over y-axis $A(0, 3) \rightarrow A'(\ ,\ )$ $B(2, 4) \rightarrow B'(\ ,\ )$ $C(3, 0) \rightarrow C'(\ ,\ )$
Rotation of 90° with center at (0, 0) $A'(\ ,\ ) \rightarrow A''(-3, 0)$ $B'(\ ,\ ) \rightarrow B''(\ ,\ )$ $C'(\ ,\ ) \rightarrow C''(\ ,\ )$
Translation down 1 unit $A''(-3, 0) \rightarrow A'''(-3, -1)$ $B''(\ ,\ ) \rightarrow B'''(-4, -3)$ $C''(\ ,\ ) \rightarrow C'''(0, -4)$

Test Prep Tip

When describing a rotation, identify the direction and center of rotation.

1. Copy the table and complete it as you draw and label the image triangle for each transformation.
2. Identify all pairs of congruent line segments and congruent angles.
3. Explain how you know that $\triangle ABC$ is congruent to $\triangle A'''B'''C'''$.

Exercises



1. Rectangle $PQRS$ is transformed to rectangle $P'Q'R'S'$ as shown on the graph.
   a. Describe a sequence of transformations to map rectangle $PQRS$ to rectangle $P'Q'R'S'$.
   b. Identify all congruent line segments and angles.
   c. Can you perform a sequence of translations, reflections, or rotations on rectangle $PQRS$ to produce a second rectangle that is *not* congruent to the first? Explain.
2. Draw $\triangle EFG$ with vertices at $E(-2, 3)$, $F(0, 4)$, and $G(0, 0)$ and $\triangle JKL$ with vertices at $J(3, -2)$, $K(4, -4)$, and $L(0, -4)$.
   a. Describe a sequence of transformations to obtain $\triangle JKL$ from $\triangle EFG$.
   b. Describe a different sequence of transformations than you used in part a. to obtain $\triangle JKL$ from $\triangle EFG$.
   c. Do the transformations you chose affect the congruence of line segments or angles? Explain.

CC-5 Transformations and Similarity

CONTENT STANDARDS

8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

8.G.5 Use informal arguments to establish facts about the angle sum and exterior angles of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles.

You can combine transformations such as rotations, reflections, translations, and dilations. In geometry, transformations can be used when looking at similar figures. Similar figures have the same shape, whether or not they are the same size.

ACTIVITY

MATHEMATICAL PRACTICES

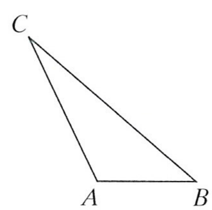
1. On a coordinate plane, draw a quadrilateral with vertices at $Q(1, 2)$, $R(4, 2)$, $S(1, -1)$, and $T(-2, -1)$. What shape is figure $QRST$?
2. Draw a reflection of the figure over the y-axis. Measure the angles. Is the image similar to the original figure?
3. Dilate the reflected image by a factor of 2 using the origin as the center of dilation. Compare the dilated image with the reflected image and the original figure. Which figures are similar? Explain your reasoning.

You know some special rules you can use to show that two triangles are congruent. Triangles have special similarity rules as well.

ACTIVITY

MATHEMATICAL PRACTICES

You can arrange congruent triangles to find the sum of the interior angles of a triangle.



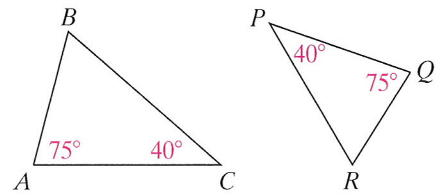
1. Make three tracings of $\triangle ABC$. Arrange the triangles so that $\angle B$ is adjacent to $\angle A$ and $\angle C$. Identify any parallel sides.
2. Extend the parallel sides into lines. Based on what you know about the angles formed by parallel lines and transversals, mark the congruent angles. Use your drawing to determine the measure of $\angle A$ in terms of $\angle B$ and $\angle C$.
3. What type of angle is formed by adjacent $\angle A$, $\angle B$, and $\angle C$?
4. What can you conclude about the sum of the interior angles in the triangle?

Use after Lesson 7-3.

ACTIVITY

MATHEMATICAL PRACTICES

1. Find the third angle measure in each triangle below.



2. Write a similarity statement showing that the triangles are similar.
3. Do you need to find the measure of the third angle in both triangles to write a correct similarity statement? Explain.
4. What is the minimum number of angle measures you need to know to determine if two triangles are similar?
5. What conclusion can you make about angles in a triangle and triangle similarity?

Exercises

Test Prep Tip

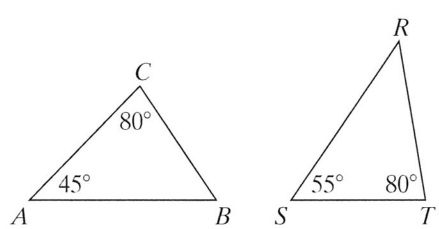
When describing transformations on the coordinate plane, remember to specify the direction of a translation, the center of a rotation or a dilation, and the scale of a dilation.

For Exercises 1–2, determine whether the figures are similar. If so, describe a sequence of transformations to obtain one from the other.

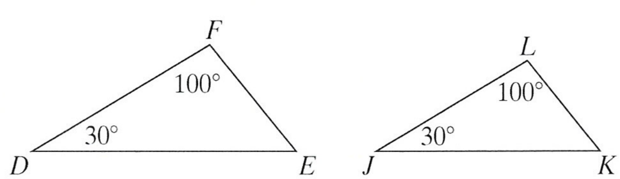
1. one quadrilateral with vertices at $(-1, 1)$, $(-4, 1)$, $(-4, 3)$, and $(-2, 3)$; one with vertices at $(6, 1)$, $(0, 1)$, $(0, 5)$, and $(4, 5)$
2. one triangle with vertices at $(0, 0)$, $(-3, 0)$, and $(-3, 6)$; one with vertices at $(0, 0)$, $(0, 2)$, and $(4, 2)$
3. Graph a quadrilateral with vertices at $A(-1, 1)$, $B(1, 1)$, $C(3, -1)$, and $D(1, -1)$. Reflect it across the x-axis, and then dilate the reflected image by a factor of 3 using the origin as the center of dilation. Write a similarity statement for this situation.

For Exercises 4–5, write a similarity statement.

4.



5.



6. **Reasoning** In the coordinate plane, does the order of transformations affect similarity? Explain.

CC-6 Using the Pythagorean Theorem With Three-Dimensional Figures

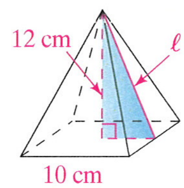
CONTENT STANDARDS

8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in … three dimensions.

Right triangles are often found in three dimensional figures, so the Pythagorean Theorem can be used to determine lengths.

EXAMPLE Finding Surface Area

1 Find the surface area of the square pyramid.



Step 1: Find the lengths of the legs of the right triangle. One leg is the height, 12 cm. One leg is half the length of the base, 5 cm.

Step 2: Find the slant height.

$5^2 + 12^2 = \ell^2$ ← **Use the Pythagorean Theorem.**

$13 = \ell$ ← **Solve.**

Step 3: Find the surface area using a formula.

$S.A. = 2b\ell + b^2$ ← **Surface area of a square pyramid**

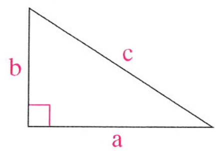
$S.A. = 2(10)(13) + 10^2$ ← **Substitute 10 for b and 13 for ℓ.**

$S.A. = 360$ ← **Simplify.**

The surface area is 360 cm^2.

Vocabulary Tip

The Pythagorean Theorem is represented by the following equation.



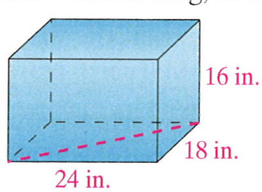
$a^2 + b^2 = c^2$

Quick Check

1. Find the surface area of a square pyramid that has a height of 5 cm and a slant height of 13 cm.

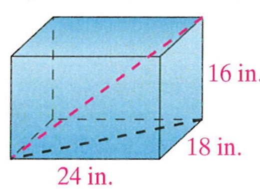
EXAMPLE Application: Packaging

2 Doug is shipping a 32-inch long umbrella. Will the umbrella fit in a box that is 24 inches long, 18 inches wide, and 16 inches tall?



Step 1: Use the Pythagorean Theorem to find the diagonal length of the bottom of the box.

$$a^2 + b^2 = c^2$$
$$24^2 + 18^2 = c^2$$
$$30 = c$$



Step 2: Use the Pythagorean Theorem to find the diagonal length from top to bottom corner.

$$a^2 + b^2 = c^2$$
$$30^2 + 16^2 = c^2$$
$$34 = c$$

The diagonal length is 34 inches. The umbrella will fit.

Use after Lesson 8-5.

Quick Check

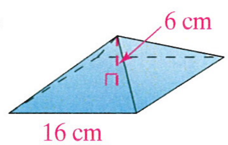
2. Will a pen that is 14 cm long fit into a 3-cm by 4-cm by 12-cm box?

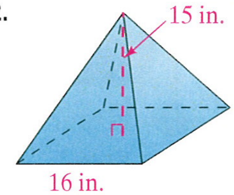
Homework Exercises

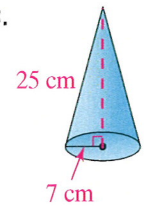
GO for Help

For Exercises	See Examples
1–3	1
4–6	2

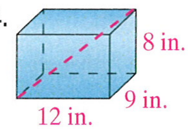
Find the surface area of each shape.

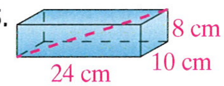
1. 

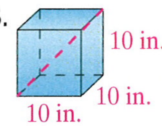
2. 

3. 

Find the length of the diagonal.

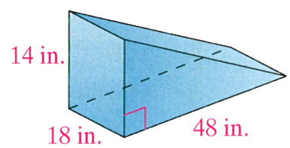
4. 

5. 

6. 

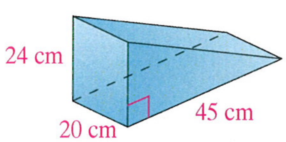
GPS

7. **Guided Problem Solving** Gillian is building a portable pet ramp with the dimensions shown below.



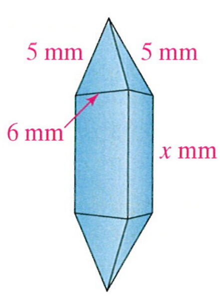
She wants to cover all the faces of the ramp with carpet, which costs \$1.59 per square foot (1 square foot = 144 square inches). How much does the carpeting cost?

- Find the length of the hypotenuse of the right triangle.
- Find the surface area of the ramp. Convert to square feet.
- What is the total cost of the carpeting?



8. Stephen is constructing a ramp to test his model car. The ramp is a triangular prism. The wood costs \$3.12 per square meter. ($1\text{ m}^2 = 10{,}000\text{ cm}^2$). How much does the wood cost?

9. **Writing in Math** How is using the Pythagorean Theorem to find a missing measurement of a three-dimensional object similar to finding the missing measurement of a right triangle?



10. **Algebra** Jorge uses crystals of various lengths to make jewelry. Each crystal has 3 rectangular faces and 6 triangular faces. Each triangular face has side lengths of 5 mm, 5 mm, and 6 mm as shown. Each rectangular face has a width of 6 mm and a length of x mm.
    a. A crystal has a surface area of 450 mm^2. What is the value of x?
    b. What is the value of x if the surface area equals 522 mm^2?

CC-7 Exploring Bivariate Data

CONTENT STANDARDS

8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

A data set with two variable quantities contains **bivariate data**. If the two quantities are related, a pattern of association can be found between them. A scatter plot can help you recognize patterns, such as whether data is linear, or whether it is clustered or has outliers.

ACTIVITY MATHEMATICAL PRACTICES

In a free-throw contest, each participant had 10 tries to score a basket. The table below shows the relationship between hours of practice the day before the contest and the number of baskets scored by each participant.

Hours of Practice	2	4	3	4	6	2	1	9	1	5
Baskets Scored	4	4	5	6	7	3	9	7	3	5

1. What are the two variable quantities in the data set?
2. Construct a scatter plot for the data. Does it matter which variable you choose for the horizontal scale? Explain.
3. Describe the distribution of points on the scatter plot.
4. Why do you think the data is clustered this way?
5. Describe the pattern of association between the two quantities.
6. Identify any outliers on the graph, and explain their meaning.

Two variables can have a nonlinear association.

ACTIVITY MATHEMATICAL PRACTICES

A school group sells raffle tickets to raise money for charity. They change the ticket price each month to see how price affects total revenue. The table shows prices and revenues for eight months.

Charity Raffle Ticket Prices and Total Revenue

Ticket Price	Total Revenue	Ticket Price	Total Revenue
\$5	\$900	\$7	\$420
\$8	\$320	\$1	\$300
\$2	\$560	\$4	\$1,000
\$3	\$810	\$6	\$720

Use after Lesson 9-7.

1. Construct a scatter plot for the data. Describe the pattern of association shown in the graph.
2. The number of tickets sold each month is the total revenue divided by the ticket price. How does increasing the price affect the number of tickets sold?
3. Is the number of tickets sold related to the pattern of association between ticket price and revenue? Explain.

Exercises

1. Twelve members of a gym were asked how long they use the pool and how long they use the weight room each week.

Weight Room (hrs)	2	10	0	1	3	9	10	9	2	8	1	8
Pool (hrs)	2	1	1	8	1	1	2	2	0	3	0	2

   a. Construct a scatter plot for this data. Describe any patterns of association.
   b. Based on the data, is the weight room or the pool more likely to show damage from use? Explain your answer.

Test Prep Tip
The amount of data plotted in a scatter plot affects the pattern of association. Too few data points can cause nonlinear data to appear linear.

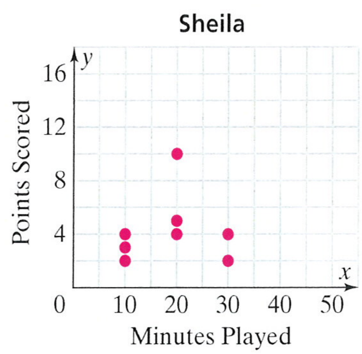
2. The table below shows gas mileage of cars at different speeds.

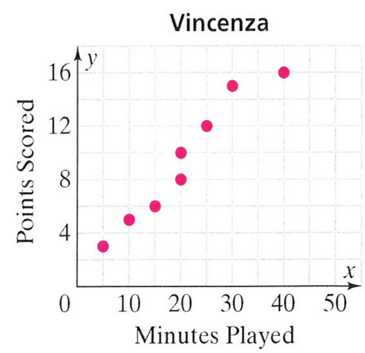
Speed (miles per hour)	15	35	20	30	40	30	25
Miles per Gallon of Gas	14	26	18	24	28	26	21

   a. Construct a scatter plot for this data. How do you interpret the pattern of association between speed and miles per gallon?
   b. Incorporate the data below into the scatter plot. Given the new data, does the pattern of association change?

Speed (miles per hour)	50	45	55	65	55	60
Miles per Gallon of Gas	32	30	30	27	29	28

3. The scatter plots below show the relationship between minutes played and points scored for two basketball players.





   a. Compare the data for Sheila and Vincenza. What patterns of association do you see?
   b. What could explain why the players have two different patterns in their data?

CC-8 Modeling Data With Lines

CONTENT STANDARDS

8.SP.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

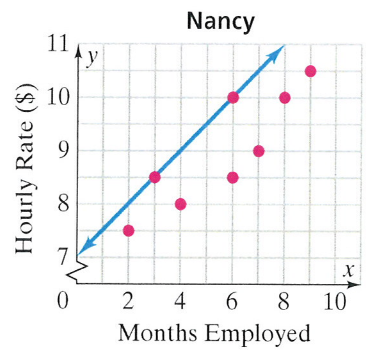
8.SP.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.

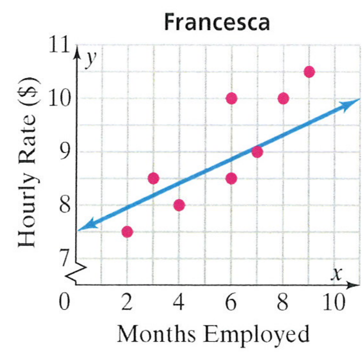
Positive and negative trends can be modeled by lines. You can examine the data to determine how accurate the model is.

ACTIVITY

MATHEMATICAL PRACTICES

In the scatter plots below, Nancy and Francesca each drew a different trend line for the same set of data.

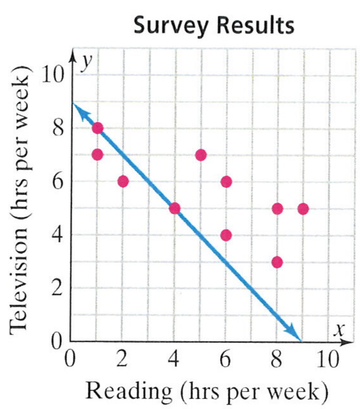




1. Compare the points plotted on each graph. Are any points different?
2. What process do you think Nancy followed to fit her line?
3. What process do you think Francesca followed to fit her line?
4. Which line appears to be the better fit? Explain.
5. Copy and complete the chart below for Nancy's line. Find how close the predicted value is to the actual value for each data point.

Actual Rate ($)								
Predicted Rate ($)								
Difference								

6. Find the average of the distances. About how close is Nancy's line to most of the actual values?
7. Make a table for Francesca's line. How close is Francesca's line to the actual values?
8. Which line is better for making predictions? Explain.
9. The scatter plot at the left shows results of a survey about hours spent reading and hours spent watching television. Find a line that fits the data better than the one shown.
10. Justify that your line fits the data better than the line shown.
11. Find the equation for your line. What do the slope and intercept represent?

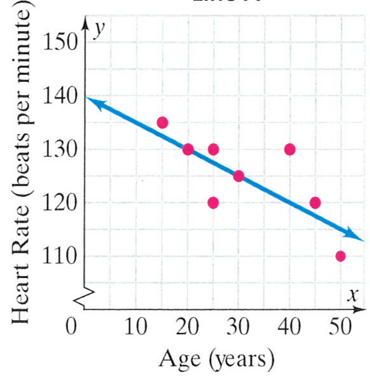


Use after Lesson 9-7.

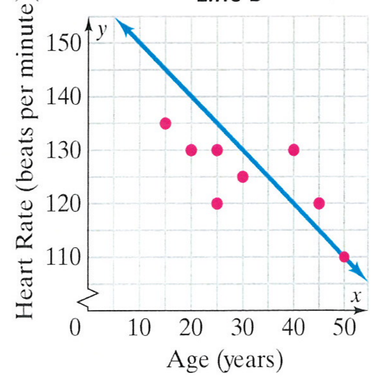
Exercises

1. The scatter plots below display the same data about the ages of eight health club members and their heart rates during exercise.

Line A



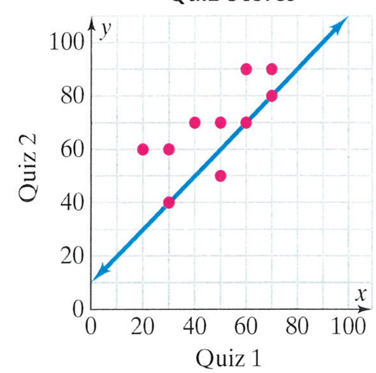
Line B



a. Which line is a better fit for the data? Explain your reasoning.

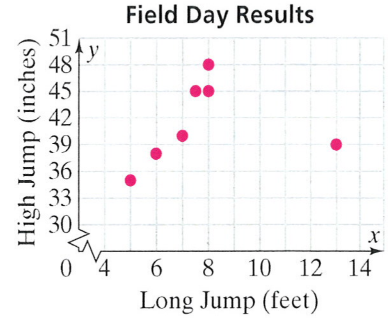
b. Which line is a better fit for the data? Explain your reasoning.

Quiz Scores



2. The scatter plot at the right shows the relationship between scores on two different quizzes for ten students in a math class.
   a. Assess the fit of the given line for the data.
   b. Copy the scatter plot. Draw a line of your own that is a better fit.
   c. Explain why your line is a better fit.

Field Day Results

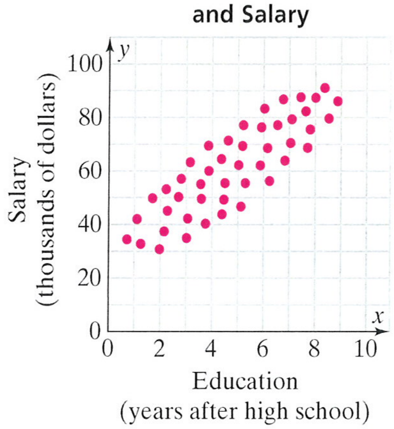


3. The scatter plot at the right shows long jump and high jump results for a school field day.
   a. Which point in the scatter plot is an outlier?
   b. How would a trend line for this data be different if you eliminated the outlier?
   c. In general, what affect does an outlier have on a trend line?

Test Prep Tip

It is possible that none of the points in the scatter plot will actually be on the line of best fit.

Post–High School Education and Salary



4. **Writing in Math** The scatter plot at the left shows results of a national survey about years of post–high school education and annual salary.
   a. Describe how you would fit a line to model the relationship between the variables.
   b. Explain how you would assess the fit of your model.
   c. Find the equation of a linear model for the data. Explain what the slope and intercept represent.

CC-9 Relative Frequency

CONTENT STANDARDS

8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

Some data variables are represented as categories.

ACTIVITY MATHEMATICAL PRACTICES

Fifty moviegoers were surveyed about their favorite movie types.

- 15 men and 6 women chose "Action" as their favorite type.
- 9 men and 10 women chose "Drama" as their favorite type.
- 6 men and 4 women chose "Comedy" as their favorite type.

1. What categorical variables are represented by the collected data?

2. Use the template below to construct a two-way frequency table.

Results of Favorite Movie Type Survey

	Action	Drama	Comedy	Total
Men				
Women				
Total				

3. How many moviegoers chose action movies as their favorite type?

4. What is the most popular type of movie? Explain your answer.

5. What percent of people surveyed were men who chose dramas?

6. A relative frequency table shows the portion of the population in each category. To find the relative frequency, divide each frequency by the total number of respondents to the survey.

Relative Frequencies for Survey

	Action	Drama	Comedy
Men			
Women			

7. Find the total of all of the relative frequencies. Will this total be the same for all relative frequency tables? Explain.

8. You can also calculate relative frequencies for each row to examine the association between the two variables. Of the men surveyed, 50% like action movies. Copy and complete the table below.

Relative Frequencies for Men and Women

	Action	Drama	Comedy	Total
Men				100%
Women				100%

9. Why do each of the rows total 100%?

Use after Lesson 9-9.

10. Six men and four women chose comedy as their favorite movie type. Does this mean that comedy movies are more popular with men than with women? Explain your reasoning.

11. You can also calculate relative frequencies for each column to examine the association between the other three variables. Copy and complete the table below.

Relative Frequencies for Movie Type

	Action	Drama	Comedy
Men			
Women			
Total			

12. What conclusions can you draw from this relative frequency table?

Exercises

1. Construct a two-way table with two categories for each row and column for the data below.

Student Survey

Walked to School	Y	Y	N	Y	N	N	N	Y	N	Y
Music Lesson	N	Y	Y	N	N	Y	N	N	Y	N

Is there evidence that students who walked tended not to have music lessons? Explain.

2. A survey was taken at a university. Students responded to the statement "A new student center should be built."
   a. Use the given information to complete the table.

Results of Response to Survey

	Freshman	Sophomore	Junior	Senior	Total
Agree		336	264	168	1,200
Disagree	288	144		120	
No opinion	192		24	96	432
Total		600	504		

   b. What was the most frequent response?
   c. Construct a relative frequency table to calculate the frequencies by column. Is there evidence that a new student center is more popular with freshmen than seniors?
   d. What is a possible explanation for the outcome?

3. Design a survey with two categorical variables for your class. Construct a two-way relative frequency table for your data, and interpret the results of your survey.

CC-10 Slope and Similar Triangles

CONTENT STANDARDS

8.EE.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.

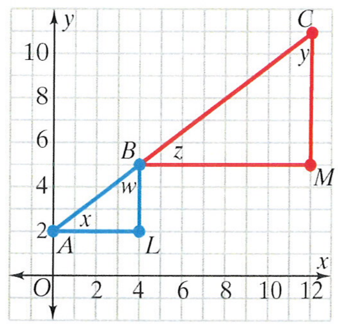
Use after Lesson 11-4.

You can use what you know about similar triangles to learn more about the slopes between different points on a line.

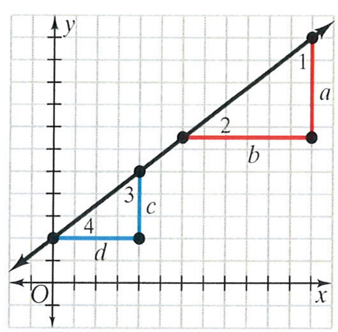
ACTIVITY

MATHEMATICAL PRACTICES

Use the diagram below to explore slope and similar triangles.



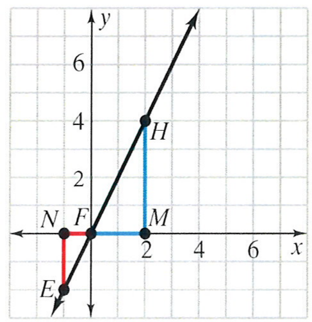
1. Side BL and side CM are both vertical lines. Are they parallel?
2. The line containing points A, B, and C is a transversal that intersects $\overline{BL}$ and $\overline{CM}$. Why is angle w congruent to angle y?
3. Is angle x congruent to angle z? Explain.
4. Is $\triangle ABL$ similar to $\triangle BCM$? Justify your answer.
5. Write a ratio in the form for each triangle. How do the two ratios compare?
6. How does the ratio of the vertical and horizontal side lengths for the small triangle compare to the slope of the hypotenuse?
7. Is the slope of the line between points A and B the same as the slope of the line between points B and C? Justify your answer.
8. Use the diagram below and similar triangles to explain why the slope m is the same between any two distinct points on a line.



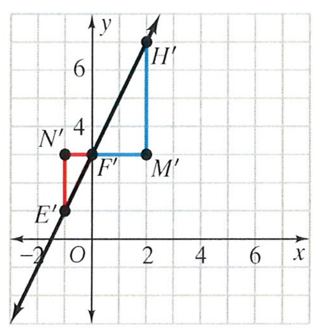
You can use slope and similar triangles to derive formulas for lines in the coordinate plane.

ACTIVITY MATHEMATICAL PRACTICES

The graph shows four points that lie along a line that passes through the origin. $\triangle FMH$ was formed by drawing a vertical segment down from point H and a horizontal segment over from point F. The same method was used to form $\triangle FNE$.



1. Are $\triangle FMH$ and $\triangle FNE$ similar figures? Explain.
2. Write a proportion for the vertical and horizontal side lengths of the two triangles. Write the ratios as .
3. How are the proportional ratios of the side lengths related to the slope m of the line?
4. Use the slope to write the equation of line EH: $y = \square x$.
5. Write a general equation for a line with slope m passing through the origin. Explain your reasoning.
6. How does the position of $\triangle F'N'E'$ in the graph below compare to the position of $\triangle FNE$ in the original graph above?



7. Did the ratios of the vertical and horizontal side lengths for the two triangles change during the translation?
8. Each point is translated. Complete the equation that relates y to x for line $E'H'$: $y = \square x + \square$
9. Write a general equation for a line with slope m that intercepts the vertical axis at $(0, b)$. Explain how you found your answer.

Test Prep Tip

A *translation* is a transformation that moves each point of a figure the same distance and in the same direction.

CC-11 Graphing Proportional Relationships

CONTENT STANDARDS

8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

One way to understand proportional relationships is to represent them using a graph.

ACTIVITY

MATHEMATICAL PRACTICES

The sign shows the prices of tomatoes for three different weights at a farmer's market.

1. Is the relationship shown on the sign proportional? Explain how you know.
2. Using (number of pounds, price) as points, graph the values from the sign on a coordinate graph.
3. Where does the line containing the points intersect the y-axis?
4. Find the slope of the line that contains the points.
5. Find the cost of one pound of tomatoes. What is the unit rate?
6. How is the unit rate related to the slope?
7. How can you find a unit rate based on a linear graph?

Vocabulary Tip

Recall that a unit rate is the rate for one unit of a given quantity. For example, 30 miles per hour is a unit rate.

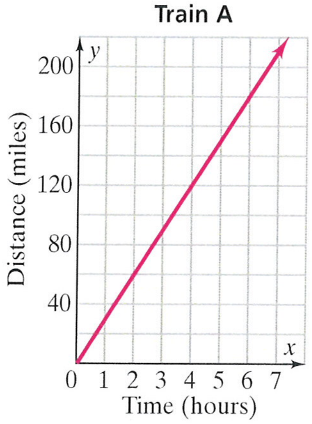
You can use what you know about slope and unit rate to compare proportional relationships shown in tables, graphs, or equations.

ACTIVITY

MATHEMATICAL PRACTICES

Three trains (A, B, and C) leave a train station at the same time. The graph at the left shows the relationship between time and distance for Train A.

Train A



1. What is the slope of the graph?
2. What does this slope represent?
3. The relationship between time and distance for Train B is given by the equation $y = 45x$, where x represents hours and y represents miles. Find the slope m.

Use after Lesson 11-5.

4. Which train is moving faster, Train A or Train B? How do you know?
5. The time-distance relationship for Train C is shown in the table at the right. What is the ratio of distance to time?
6. Compare the speed of Train C to the speeds of Train A and Train B.

Train C

Time (hours)	Distance (miles)
3	105
6	210
9	315
12	420

Exercises

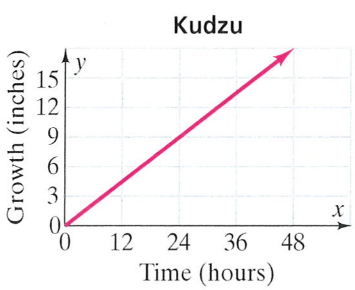
1. Total snowfall for a December blizzard is given by the equation , where x represents hours and y represents inches. Total snowfall for a January blizzard is given in the table below.

Snowfall

Time (hours)	3	6	9	12
Total Snowfall (inches)				

   a. In which blizzard did the snow fall more quickly? Explain.
   b. Slope can be written as to show it is also a unit rate. Solve a proportion to write the slope for each blizzard in this format.

2. A scientist measured the growth rate of a bamboo plant at 6 inches in 12 hours. She compared the growth rate of the bamboo plant to the growth rate of three other plants.
   - The growth rate of bull kelp is given by the equation , where x represents hours and y represents inches.
   - The growth rate for a kudzu is shown in the graph at the left.
   - The growth rate for a giant sea kelp plant is shown in the table.

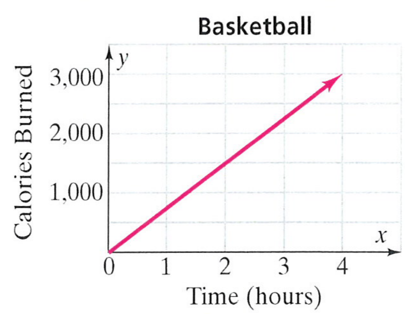


Giant Sea Kelp

Time (hours)	2	4	6	8
Growth (inches)				5

   Did any of these plants have a faster growth rate than the bamboo plant? Explain your reasoning.

3. The equation $y = 11x$ represents the calories Jake burns when cross-country skiing, where x is time in minutes and y is number of calories. The graph at the right shows the calories he burns while playing basketball. Which activity burns calories at a faster rate? Explain.



CC-12 Solving Systems of Equations

CONTENT STANDARDS

8.EE.8.a Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

8.EE.8.b Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple equations by inspection.

8.EE.8.c Solve real-world and mathematical problems leading to two linear equations in two variables.

A **system of equations** is collection of two or more equations that have the same variables. A system of linear equations can have one solution, infinitely many solutions, or no solutions. Any solution of such a system is an ordered pair that satisfies both equations.

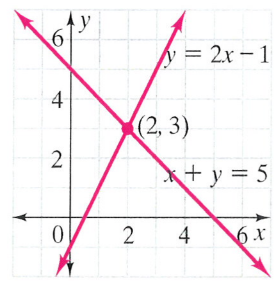
You can use several methods to find the solution to a system of two linear equations. One method is to find where the graphs of the equations intersect.

EXAMPLE 1 Solve by Graphing

Solve each system of equations by graphing.

a. $\begin{cases} y = 2x - 1 \\ x + y = 5 \end{cases}$

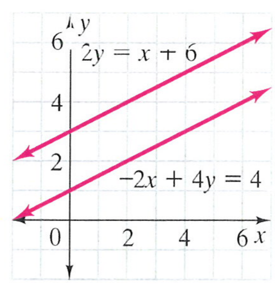
Graph both equations on the same coordinate plane. The lines appear to intersect at (2, 3). Check by replacing x with 2 and y with 3 in each equation.



$y = 2x - 1$	$x + y = 5$
$3 = 2(2) - 1$	$2 + 3 = 5$
$3 = 3$ ✓	$5 = 5$ ✓

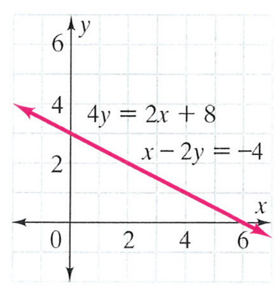
b. $\begin{cases} -2x + 4y = 4 \\ 2y = x + 6 \end{cases}$

Graph both equations. The lines are parallel and do not intersect. Therefore, the system of equations has no solution.



c. $\begin{cases} x - 2y = -4 \\ 4y = 2x + 8 \end{cases}$

Graph both equations. The graphs of the equations are the same line. The system has infinitely many solutions because the lines intersect at infinitely many points.



Quick Check

1. Solve each system of equations by graphing.

a. $\begin{cases} 2y = 6x + 4 \\ 3x - y = -2 \end{cases}$ **b.** $\begin{cases} x + 2y = 6 \\ y = 3x - 4 \end{cases}$ **c.** $\begin{cases} 2x - 6y = 6 \\ 3y = x + 3 \end{cases}$

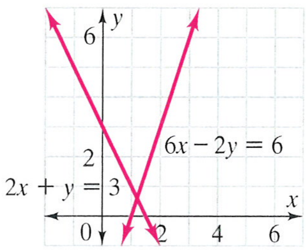
Use after Lesson 11-6.

You can use algebraic methods to solve a system of equations.

EXAMPLES Solve by Algebraic Methods

Test Prep Tip

Before solving by substitution, you can estimate the solution by graphing.



2 Solve the system of equations by substitution: $\begin{cases} 2x + y = 3 \\ 6x - 2y = 6 \end{cases}$

Step 1: Isolate a variable on one side of either equation.

$2x + y - 2x = 3 - 2x$ ← **Subtract $2x$ from each side of $2x + y = 3$.**

$y = 3 - 2x$ ← **Simplify.**

Step 2: Substitute for the isolated variable in the other equation.

$6x - 2(3 - 2x) = 6$ ← **Substitute $3 - 2x$ for y.**

$6x - 6 + 4x = 6$ ← **Use the Distributive Property.**

$x = 1.2$ ← **Solve for x.**

Step 3: Substitute the value into the equation from Step 1.

$y = 3 - 2(1.2) = 3 - 2.4 = 0.6$

The solution is $(1.2, 0.6)$.

3 Solve the system of equations by elimination: $\begin{cases} 10x - 7y = 2 \\ -5x + 3y = -3 \end{cases}$

Step 1: Multiply both sides of one equation by a number so that the coefficients of the same variable in each equation are additive inverses of each other.

$2(-5x + 3y) = 2(-3)$ ← **Multiply the second equation by 2.**

$-10x + 6y = -6$ ← **Simplify. $-10x$ is the additive inverse of $10x$.**

Step 2: Eliminate one variable by adding equations.

$$\begin{array}{rr} & 10x - 7y = 2 \\ (+) & \underline{-10x + 6y = -6} \\ & -y = -4 \end{array}$$

← **Add to eliminate the x-variable.**

$y = 4$ ← **Simplify.**

Step 3: Substitute the result in either equation.

$-5x + 3(4) = -3$ ← **Substitute 4 for y in the second equation.**

$-5x + 12 = -3$ ← **Simplify.**

$x = 3$ ← **Solve for x.**

The solution is $(3, 4)$.

Test Prep Tip

Check your solution by replacing x with 3 and y with 4 in each equation.

$10x - 7y = 2$
$10(3) - 7(4) = 2$
$30 - 28 = 2$
$2 = 2$ ✓

$-5x + 3y = -3$
$-5(3) + 3(4) = -3$
$-15 + 12 = -3$
$-3 = -3$ ✓

Quick Check

2. Solve each system of equations by substitution.

a. $\begin{cases} 3x + y = 2 \\ 4x - 2y = -2 \end{cases}$ **b.** $\begin{cases} 2x - 2y = 2 \\ 5x + y = 14 \end{cases}$ **c.** $\begin{cases} x - 2y = 2 \\ 3x + 4y = 3 \end{cases}$

3. Solve each system of equations by elimination.

a. $\begin{cases} 8x - 3y = 4 \\ -4x + 4y = 8 \end{cases}$ **b.** $\begin{cases} 2x + 3y = 13 \\ 3x + 6y = 9 \end{cases}$ **c.** $\begin{cases} 2x + 2y = 6 \\ -6x - 2y = 6 \end{cases}$

Sometimes you can solve a system of equations by thinking about how the equations are related.

EXAMPLE 4 Solve by Inspection

Solve each system of equations by inspection.

a. $\begin{cases} x = 5 \\ x + y = 12 \end{cases}$ Think: Substitute 5 for x in the second equation. Use mental math: $5 + 7 = 12$. The solution is $(5, 7)$.

b. $\begin{cases} 3x + 2y = 5 \\ 3x + 2y = 6 \end{cases}$ Think: $3x + 2y$ cannot equal both 5 and 6. The system of equations has no solution.

c. $\begin{cases} x + y = 2 \\ 2x + 4y = 4 \end{cases}$ Think: $2x + 4y = 4$ is $x + y = 2$ multiplied by 2. When graphed, these two equations are the same line. So, this system has infinitely many solutions.

Quick Check

4. Solve each system of equations by inspection.

a. $\begin{cases} 4x + 7y = 3 \\ 4x + 7y = 5 \end{cases}$ b. $\begin{cases} 3x + y = 9 \\ 9x + 3y = 27 \end{cases}$ c. $\begin{cases} x = 4 \\ x + y = 10 \end{cases}$

EXAMPLE 5 Application: Phone Plans

Nia's phone plan charges a monthly rate of \$42.00 plus \$0.20 per text. Rick's phone plan charges a monthly rate of \$45.00 plus \$0.10 per text. When will the monthly charge be the same for both plans?

Step 1: Write a system of equations to represent both plans. Let x be number of texts and y be the monthly charge.

Nia's plan: $y = 42 + 0.2x$ Rick's plan: $y = 45 + 0.1x$

Step 2: Choose a method. Think: $42 + 0.2x$ can be substituted for y in the second equation.

$42 + 0.2x = 45 + 0.1x$ ← **Substitute $42 + 0.2x$ for y in Rick's plan.**

$0.1x = 3$ ← **Simplify.**

$x = 30$ ← **Multiply both sides by 10.**

The monthly charge will be the same for 30 text messages.

Step 3: Substitute 30 for x in either equation to find the monthly charge.

$y = 42 + 0.2(30)$ ← **Substitute 30 for x in the first equation.**

$y = 48$ ← **Simplify.**

The monthly charge when both plans cost the same is \$48.00.

Test Prep Tip

Check your solution by substituting 30 for x into the other equation to see if the monthly charge is the same.

$y = 45 + 0.1x$
$y = 45 + 0.1(30)$
$y = 45 + 3$
$y = 48$ ✓

Quick Check

5. Juan's phone plan charges a monthly rate of \$40.00 plus \$0.40 per text. When is Juan's monthly charge the same as Nia's?

Homework Exercises

GO for Help

For Exercises	See Examples
1–3	1
4–6	2
7–9	3
10–12	4
13	5

Solve each system of equations.

1. $\begin{cases} x - 4y = 8 \\ 4y = x + 4 \end{cases}$

2. $\begin{cases} 2y = 4x - 2 \\ 6x - 3y = 3 \end{cases}$

3. $\begin{cases} 3x - 3y = -3 \\ y = 2x + 2 \end{cases}$

4. $\begin{cases} 2x + y = 3 \\ 2x - 4y = 1 \end{cases}$

5. $\begin{cases} x + 3y = 5 \\ 2x - 6y = 4 \end{cases}$

6. $\begin{cases} 4x + y = -1 \\ 2x - 2y = 9 \end{cases}$

7. $\begin{cases} 2x + 3y = 11 \\ -4x + 2y = 2 \end{cases}$

8. $\begin{cases} 5x - 6y = 1 \\ 2x + 2y = 18 \end{cases}$

9. $\begin{cases} -2x - 9y = 4 \\ 3x + 3y = 15 \end{cases}$

10. $\begin{cases} y = 8 \\ x + y = 13 \end{cases}$

11. $\begin{cases} 2x - 3y = 1 \\ 6x - 9y = 3 \end{cases}$

12. $\begin{cases} 3x + 8y = 18 \\ 3x + 8y = 21 \end{cases}$

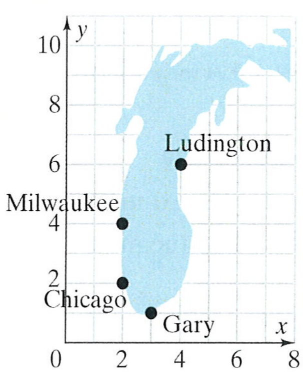
13. Trey's online music club charges a monthly rate of \$20.00 plus \$0.80 per song download. Deb's online music club charges a monthly rate of \$21.00 plus \$0.60 per song download. For what number of songs will the monthly charge be the same for both clubs?

GPS

14. **Guided Problem Solving** A line is drawn through the points (2, 3) and (6, 5). A second line is drawn through the points (2, 5) and (4, 2). Do the lines intersect? Justify your answer.
    - Graph the lines to determine if they intersect.
    - Write an equation for each line.
    - Solve the system of equations.

15. A line is drawn through the points (1, 1) and (4, 3). A second line is drawn through the points (2, 3) and (3, 1). Do the lines intersect? Justify your answer.

16. **Writing in Math** Explain how to solve the system $5x - 6y = 8$ and $-3x + 11y = 10$ by using the elimination method.



17. Boat A travels in a straight line from Milwaukee to Gary. Boat B travels in a straight line from Ludington to Chicago. Is there a point where the boats could meet? Justify your answer.

Solve each system of equations using the method you think is most efficient. Explain your choice.

18. $\begin{cases} x - 2y = 2 \\ 3x - 3y = 9 \end{cases}$

19. $\begin{cases} 5x - 2y = 1 \\ 2x + 4y = 10 \end{cases}$

20. $\begin{cases} 5x - 2y = 6 \\ 5x - 2y = -6 \end{cases}$

21. $\begin{cases} 6x - 4y = 6 \\ -2x + 3y = 3 \end{cases}$

22. $\begin{cases} y = 2x - 6 \\ y = x - 5 \end{cases}$

23. $\begin{cases} x - y = 5 \\ 4x - 4y = 20 \end{cases}$

CC-13 Comparing Functions

CONTENT STANDARDS

8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

The slope of a line describes the rate of change of that line. You can compare slopes of lines represented in different ways.

EXAMPLE 1 Comparing Linear Functions

Which function has a greater rate of change?

x	1	2	3	4
y	5	8	11	14

$3y - 6 = 12x$

Step 1 Find slope from a table.

(1, 5) and (4, 14)

slope = = 3

Step 2 Find the slope of an equation using $y = mx + b$.

$3y - 6 = 12x$

$3y = 12x + 6$ ← **Add 6.**

$y = 4x + 2$ ← **Divide by 3.**

The slope, m, is 4.

Since $4 > 3$, the function $3y - 6 = 12x$ has a greater rate of change.

Quick Check

1. Which function has the greater rate of change?

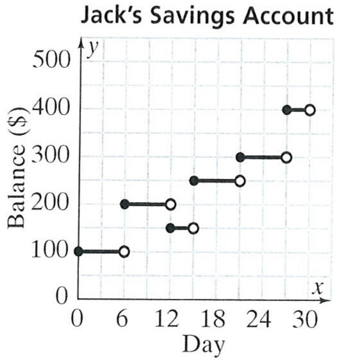
x	1	3	4	6
y	5	13	17	25

$2y - 2 = 4x$

To compare functions, find where the functions increase or decrease; whether they are continuous; and the highest and lowest values.

EXAMPLE 2 Comparing Nonlinear Functions

Jack's Savings Account



Jack and Manny each have a savings account. The graph at the left represents Jack's account. Manny deposited \$500 and withdrew \$20 each even-numbered day for 30 days. Compare the functions.

Jack's Account	Manny's Account
increases and decreases	decreases
not continuous	not continuous
maximum \$400; minimum \$100	maximum \$500; minimum \$200

Quick Check

2. Vikram opened a savings account with \$150. He deposits \$150 every two weeks. Compare Vikram's account to Jack's account.

Use after lesson 11-7.

Homework Exercises

GO for Help

For Exercises	See Examples
1–4	1
5–6	2

Determine which function has the greater rate of change.

1. $y = 3x - 4$;

x	1	2	3	4
y	8	10	12	14

2. $y = 1.5x + 2$;

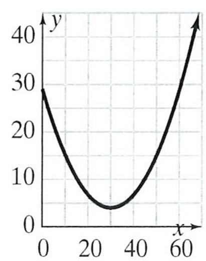
x	0	3	6	9
y	1	5	9	13

3. $y = x -$;

x	0	2	4	6
y	−4	6	16	26

4. $0.2y = 0.5x + 0.1$;

x	2	4	6	8
y	5.5	11	16.5	22



Compare the functions with the graph at the left.

5. When the value of x is 0, the value of y is 15. Each time the value of x increases by 1, the value of y increases by 3.

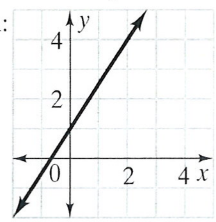
6. When the value of x is 0, the value of y is 640. Each time the value of x increases by 1, the value of y is halved.

GPS

7. Guided Problem Solving Order functions A, B, C, and D from least to greatest rate of change.

- Find the slope for each function.

A:



B: $2x - 4y = 1$

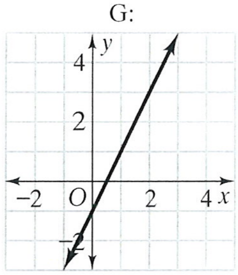
C:

x	−2	0	2	4
y	7	9	11	13

D: As x increases by 3 units, y increases by 2 units.

8. Order functions G, T, E, and W from least to greatest slope.

G:



T:

x	−4	0	4	8
y	2	3	4	5

E: $5x - 3y = -6$

W: As x increases by 3 units, y increases by 1 unit.

9. Order the stocks from greatest to least rate of price increase.

Alpha, Inc.

Week	0	1	2	3	4
Price($)	16	19	22	25	28

Beta Co.
A starting price of $54 decreases weekly by $2.50.

Delta Corp.

Week	0	1	2	3	4
Price($)	21	16.5	12	7.5	3

Gamma, Inc.
$7w - 2d = 54$
(w is weeks, d is dollars)

10. Writing in Math The functions below represent pricing plans for car rentals, where d is number of days and C is cost. Which plan is best?

Subcompact: Total cost is $30 plus $25 per day.

Compact: $7d - 0.25C = -10$

Luxury:

d	2	3	7	14
C	100	130	250	460